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# POPULATION DATA REQUIREMENT AND THEIR APPLICATION IN MANPOWER PLANNING

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# POPULATION DATA REQUIREMENTS AND THEIR APPLICATION IN MANPOWER PLANNING

## I. INTRODUCTION

The task of this paper is to identify relevant population data requirements for manpower planning and to show their application within the manpower planning process. The objective which underlies the performance of this task is the desire to illustrate the vital relationship which ought to exist between a manpower planner and a demographer as they both contribute towards national development efforts.[1/]

Let it be noted at the outset that our consideration of this objective is useful and timely exercise particularly when there is a growing realization that manpower planning should always be an integral part of overall national development planning. We therefore urge that as we exchange ideas in this unique workshop, we should reflect on and formulate those policies and strategies that would ensure better co-operation in and co-ordination of our respective efforts and programmes towards the realization of regional and national development goals.

The paper is divided into four sections including the introduction. The nature and scope of the required population data and their relative importance within the manpower planning process are considered in section two while the utility of the data for manpower planning is highlighted in section three. The final section gives the conclusion and draws inferences from the issues raised and their applicability within the African context.

## II. NATURE AND SCOPE OF REQUIRED POPULATION DATA FOR MANPOWER PLANNING

As stated above, one of the fundamental requirements of this paper is the identification of the required population data for undertaking manpower planning exercises. In the performance of this task, we shall begin by taking a brief look at some conceptual elements embodied in contemporary manpower planning and how the process relates to the analysis of population dynamics. Next, we shall consider major sources of manpower information for planning purposes and then proceed with the specification of those required demographic variables which are considered crucial to contemporary manpower planners.

### (a) Non-traditional concept of manpower planning and its relationship to population dynamics

The theory and concept of manpower planning have over the last ten years, extended beyond the traditional forecasting of labour supply and labour demand into planning for the development and productive utilization of a nations's entire population. Unlike the traditional approach, which is a point estimate of workers to be supplied and demanded, the new approach in manpower planning which is of crucial importance to African development, embraces the entire process by which a nation's development is stimulated through the continous adjustments of the size, structure, quality, attitude and composition of its entire population.

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[1/] We would like to express our delight and appreciation to the organizers of the workshop on Population Data in Development Planning for the opportunity afforded us to contribute to the general debate on this vital relationship.

For example, issues associated with the development aspect of the process include (i) planning for present and future school enrolment in terms of pupils and facilities; (ii) evaluating and structuring educational and training contents in the light of present and future work requirements; and (iii) planning for the physical and mental capabilities of the entire population. On the utilization side, the contemporary manpower planner is concerned with (i) the appropriate allocation and distribution of the urban working population by jobs, industries and geographic location; (ii) planning for and monitoring the human capital flow relative to its recruitment, retention, retirement and replacement; (iii) planning for the making of necessary adjustments in the quality and quantity of job opportunities and labour productivity in relation to the needs and size of existing and expected population; and (iv) developing organizational strategies for the mobilization and participation of human resources in the rural and informal sectors.

Understandably, the need to consider these two **inter-related** aspects of the process **(i.e.** development and utilization) has become more and more important not only for manpower planners; but also for economic, social and political planners. The rationality is that the new approach deals simultaneously with finding appropriate means and strategies for developing the **entire** population as well as for making that population more useful and productive with a view to increase the quantity and quality of goods and services for the consumption of the identical population. This implies that a multi-dimensional circularity, which is centred around a given population, exists within the manpower planning process.

Needless to say that the existance of this circularity is a necessary but not a sufficient condition to derive the maximum 'multiplier effect'. Active collaboration, coordination and cooperation in the efforts and activities of every individual responsible for the assessment and development of those variables that are positively related to aggregate national development would be correspondingly required. These individuals include demographers, educationalists, social workers, industrialists, political scientists, development administrators, etc. with the work of the demographers providing the necessary micro-foundations for manpower planning.

(b) Sources of manpower information

A population census is the primary information source for any manpower analysis since it is a total count of a country's population whose efficient development and utilization constitute the ultimate objective of manpower planning. This source of data gathering gives, in addition to other information, valuable statistics on the personal and economic characteristics of the present and future working and **school-going** age population.

Personal characteristics statistics such as age, sex, education, geographical location, marital status, etc. do provide the manpower planner with indispensable information for analysing the composition, distribution and structure of the population as an initial step for estimating the future manpower supply. Information on occupational and industrial attachment, income levels and migration pattern do give some indications on the economic characteristics of the labour force. Of relevance to the manpower planner is that when the economic characterstics data are cross-classified by age, sex, educational levels and other personal characteristics, the resulting matrix provide a much clearer picture of the composition and quality of the current work force.

Alternative sources of manpower information which are generally employed are labour force, household and establishment surveys aimed directly at collecting information on the characteristics of the actors and their implements in the labour market. Workers dependency ratios, needed for income and promotion planning, are usually obtained from such surveys. Also derived are productivity indexes, occupation/industry matrices, employment and job conditions and the characteristics of the present work force.

Perhaps the failure of such surveys to take into account the entire population is the greatest weakness in their usage as information sources for manpower planning particularly in Africa where nearly 80 per cent of the population are in the rural and informal sectors. Nevertheless, and as shall be shown in the next section, the design of any of these surveys depends to a large extent on the availability and utilization of comprehensive processed demographic data derived basically from national population censuses.

(c) Essential demographic variables required for comprehensive manpower planning

So far we have implicitly emphasized the importance of demographic data in the process of manpower planning. What is therefore intended here is the identification of those demographic indices and trends which we considered as being crucial to the activities of the manpower planner. It should be stressed however that (a) our list is not exhaustive and (b) the specific type and form of data required is depended upon prevailing circumstances and the manpower planner's choice and objective.

Be that as it may, the following demographic variables are generally needed in one way or the other for the purpose of manpower planning:

1. Estimates and projections of the population by sex, age and region;
2. Annual and expected population growth rates;
3. Rates and trends of in and out-migration;
4. Average life expectancy and dependency ratios;
5. Age and sex specific and crude fertility and mortality rates.

We need not discuss in this paper the methodology leading to the derivation of these indicators on the assumption that they are familiar issues to the participants in this workshop. However, we wish to stress that the availability of the listed demographic variables is a result of the activities of demographers which consequentially implies the existence of a functional relationship between the work of a manpower planner and that of a demographer. An illustration of the manner in which these variables are applied by the former is the subject of the next section.

## III. APPLICATION OF POPULATION DATA IN MANPOWER PLANNING

In addition to practical experience and value judgement, statistical techniques do play a major role in manpower planning. Basic to the application of these statistical techniques is the ability for the manpower planner to appreciably assemble, analyse and utilize national and at times regional demographic data in the planning exercise. The demographic variables as identified in the preceeding section are generally applied in three major processes within the manpower planning process. They are used (i) as sampling frames for designing manpower planning surveys; (ii) as yardstick for formulating national manpower development and utilization policies; and (iii) as independent variables within manpower planning models.

To illustrate, each of the three processes shall be briefly considered in this section with selected examples cited. As an approach, emphasis shall be placed on first the utility of the process to manpower planners and then on the particular demographic variables as used in that process.

### (a) Demographic variables as sampling frames

One of the most vital surveys to the process of manpower planning is the Labour Force Survey. For the contemporary manpower planner, the labour force or work force is usually defined as the total of those in the population that are capable of doing something. From a demographic view point, the labour force is considered as a certain proportion or ratio of the population of working age and describe as the participation rate.

Several indicators are sought by the manpower planner from the labour force survey. Notably among them are the following:

(i) an estimate of present and future labour force size and cluster;
(ii) labour market information particularly relating to occupational mobility trends, income levels and types of skills needed for village administration and production;
(iii) the frequency distribution of skills and qualifications of the working age population.

The dimension of these indicators suggests that the labour force survey is intended to measure the present and potential personal and economic characteristics of the entire working age population with respect to labour productivity enhancement. Since it is neither necessary nor feasible to interview every member of that universe, the required information is generally obtained from a sample survey. The need for the labour force survey results to aid the formulators of employment and income policies as well as manpower planners implies that a stratified random sample would provide the best guide.

The most appropriate sampling frame from which the sample is to be drawn is usually derived from population censuses report. For example, the design of such sample depends upon the availability of adequate information on the population estimate by sex, age and geographic distribution.

(b) Demographic variables as yardstick for manpower policy formulation

Development economists have generally agreed that the existence of a comprehensive manpower policy is a crucial element in socio-economic development programme planning and implementation. The required policy needs to identify and formulate operating objectives that are consistent with other national objectives. As such, several issues need to be clearly defined and understood when these objectives are being determined.

Conceptually these issues relate to (i) the type of desired and established national political, social and economic objectives; and (ii) the positive and negative impact of population growth on economic growth and development. In dealing with the second element, the manpower policy formulator would rely on the use of demographic trends and indicators. The characteristics, structure, size and composition of the population ought to be studied and analysed by the policy formulator in the light of national needs and resources. This action is necessary because the direction, consistency and magnitude of these changes will have implications for the development and structure of education and training facilities as well as for deriving and manipulating equilibrum conditions in the labour market.

On the other hand, the general focus of manpower planning and programming as a policy area should be geared toward the consideration of the impact of population dynamics on the process of economic growth and income distribution within the nation. For all practical purposes, a careful analysis of the problems, issues constraints, and strategies in relation to the implementation of human resources development and utilization leads to a meaningful national population policy. For basic outputs of manpower policies such as provision of adequate education, training, wage employment and social services and infrastructure are functionally related to the size, structure, location, taste and aspirations of a given population.

Consequently, what constitutes a national population policy is partly an aggregation of manpower policies geared towards improving the quality of life of the population which in turn makes the existing and future labour force more productive. In this connexion, several questions need to be considered by the manpower policy maker among which are the following:

(i) Do the administrative and technical capabilities and/or potentials exist within the nation to transform a rapidly growing population into a group of active producers as well as effective consumers; and if not, how best can that be brought about? and

(ii) What are the qualities, composition, structure, trend direction and frequency of population movements within and without the nation; and how can this phenomenon be incorporated into the formulation of manpower development, allocation and utilization policies?

Consideration of these questions is indeed a manifestation of the linkage between the manpower policy formulator and the Demographer.

(c) Demographic data as independent variables within manpower planning models

Several manpower planning models have emerged over the years in response to the new concepts of manpower planning. Basically, these models are aimed at finding appropriate means of maximizing the results of human resources development and utilization efforts within given constraints. By and large, demographic data are required in appreciable form when most of these models are being built and simulated. An extensive illustration of this dependence on demographic data by manpower planners for estimation purposes is constrained in this paper by time and space. We shall therefore review only two examples in a bid to re-emphasize the point that a need for collaborative efforts between manpower planners and demographers exists and needs to be harnessed.

As noted earlier, manpower planning embraces planning for human resources development and utilization. Accordingly models relating to the development aspect centres on the theory of education planning while those associated with the later deal with employment, income and productivity planning. For our purposes, we shall only make a brief mention of that particular estimate, within the sphere of education planning, which is of direct interest to manpower planners; and lay more emphasis on that aspect which deals with human resources utilization since the vital relationship between demographers and education planners is presented in a separate paper.

(i) Example on human resources development planning: Estimating future school enrolment

Of greater significance to the manpower planner are estimates of future school enrolment. There are two methods usually used in deriving these estimates. There is the Grade-Cohort method based primarily on the knowledge of the level of current school enrolment and estimated ratios of student intake, retention and output. The required variables for the use of this method are:

(a) School enrolment by sex, age and grade;
(b) Promotion, dropouts and repeaters rates
(c) School age population by sex.

The second method is the enrolment-ratio method which is based essentially on the projection into the future of past and current ratios of school enrolment or of school attendance. The basic variable required is the population distribution by sex and age.

As can be seen from above, processed educational data (i.e. level and type of education by number and sex of pupils by region) and demographic data (i.e. population by age group, sex and region) will have to be made available to facilitate the usage of these two estimating methods. Underlying the need for the demographic data is the premise that the educational task of any nation will involve not only the preparation of present generation of school going age children and adults who have yet to receive a minimum level of training and knowledge; but shall also involve planning for an ever increasing number of children who will be reaching school going ages in the years to come.

This implies that a determinant factor in the estimation of the future school-going population size is the expected growth of the population. As we all know, to derive this expected growth indicator, the planner needs to know the specific mortality and fertility rates for each sex and at each age of the population. The pattern, rates and direction of in and out-migration should also be known. The prerequisite that these demographic variables be known clearly demonstrates the thesis that the availability of population data do indeed enhance the work of the manpower planner.

(ii) Example on human resources utilization planning: Projecting employment by industry and occupation

A meaningful human resource utilization planning exercise should focus on two inter-related issues. In this regard, appropriate techniques and capabilities should be developed to facilitate (i) employment opportunities and jobs allocation planning; and (ii) labour allocation and productivity planning. Some of these techniques and capabilities have already been developed and used in the more developed countries more so than they have in the less developed countries. Analysis of the literature shows that the application of these techniques particularly those relating to the planning of employment opportunities and job allocation rely on the availability of crucial demographic data. What is the nature of this dependence?

To begin with it should be noted that the ultimate objective of employment planning is to bring into equilibruium the demand for and supply of labour in order to avoid undesirable surpluses of either jobs or labour within the economy. Such planning requires a range of information on the volume and characteristics of the work force and on the absorptive capacity of the economy.

The ultimate result of this exercise is to derive a projection matrix of employment by occupation and industry. These projections are needed by the manpower planner as useful guides for:

(i) Planning, evaluating, structuring and restructuring education and training programmes;

(ii) Student counselling and guidance programmes;

(iii) Management decision making; and

(iv) Job development and placement programmes.

The major inputs to the process of projecting occupational employment by industry begins with the projection of the labour force. The labour force projections are developed from the projections of the composition of future population which in turn is a function of the composition and structure of past and present population. Additionally, essential to estimating the size of present and future labour force are estimates of total population together with estimates of overall participation rates. Of equal importance is the classification of the estimated labour force by age and sex since the manpower planner needs to know whether the labour force is mainly old or young, or whether it is aging or expected to age in the near future or whether a large proportion of the labour force is or will be young entrants into the labour market.

With the size of the labour force determined, employment shares are then estimated. Several models are used in deriving these estimates. One of such models is the fixed ratio of employment to area population model whose outcome depends greatly on present and future population estimates. Mathematically, this model is reduced to the following equation:

$$E_{ij}^{t+i} = P_{j}^{t+i} \times \left[ E_{ij}^{t} \div P_{j}^{t} \right]$$

Where $E_{ij}^{t+i}$ is projected employment in region j; $P^{t+i}$ estimated future area population and $E_{ij}^{t}$ and $P_{j}^{t}$ are estimated employment and population in the region at time t respectively. As can be seen from the equation present and future population estimates serve as weighting and deflating indicies and therefore need to be on hand for the application of the model.

Other quantitative models whose application requires information on the level and characteristics of the population have been used. For example, there are models that focus on the relationship between income distribution, consumption and employment. With the use of such models, Barbara Janowitz observed that:1/

> ... if two countries have the same average labour productivity but have different percentages of their populations in the labour force, their per-capita incomes will be unequal ...

Knowledge of the per capita index is a valuable information to the manpower planner whose role within the planning process is devoted to the efficient mobilization, development and utilization of a nation's population for increased national income and welfare. However, to obtain this indicator, demographic data will have to be made available as demonstrated in the following functional relationship:

$$\frac{\text{National Income (Y)}}{\text{Total Population(N)}} = \text{Per Capital Income} = \left[\text{The Average Labour Productivity}\right] \times \left[\text{Percentage of Population in Labour force}\right]$$

$$= \left[\frac{\text{National Income (Y)}}{\text{Labour force (L)}}\right] \times \left[\frac{\text{Labour force (L)}}{\text{Total Population (N)}}\right] = \frac{Y}{N}$$

A close examination of the above relation reveals the crucial need for demographic data in the analysis and understanding of the per capita index. In this regards demographic information such as total population by age and in most cases by Sex and region will have to be mobilized during the exercise.

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1/ Barbara Janowitz: The Effects of Demographic Factors on Age Composition and the Implications for Per Capita Income, Demography, Vol. 10 No. 4, 1973, P. 511

There are other set of models that are focused on the unification of demographic and economic variables into an econometric system of equations. The objective of such models is to establish the cause effect relationship so as to provide a guideline for developing employment creation strategies in response to the projections made. Generally, a simplistic version of these econometric models take the following form:

$$E_{ij}^{t+i} = a_i + B_i X_i + U_i$$

Where i = 1, 2,3,...., n. The B's being the associated coefficients and the X's are usually population estimates, size of present and future labour force, and Gross National Product.

Finally estimates of replacement needs or job openings will be required to complete the projection of total occupational manpower requirements. Generally, total job openings over a given period is the result of separation from the labour force due to (i) death, (ii) retirement, (iii) out-migration and (iv) transfer to other occupations.

Again it is clear that demographic data will have to be used in the derivation of these replacement needs. With respect to separation due to death and retirement, the manpower planner will have to calculate working life tables. This exercise depends on the availability of crude and specific mortality and survivor rates by age groups and sex. On the issue of out-migration, the number of people leaving the country per thousand will have to be deflated by the population estimate at the beginning of the period.

So far we have identified the required demographic data and its importance for performing manpower planning in a general way. Two major examples were given to illustrate its usefulness which, incidentally, is correlated with the degree of population problem existing within a nation or region. That is, the more pressing population pressures are on the development process of a nation (region) the more use should be made of demographic data in the planning process particularly in human resources development and utilization planning. This as we shall see in the next section, holds true for the countries of Africa.

## IV. INFERENCES FOR INTEGRATING POPULATION DATA IN MANPOWER PLANNING IN AFRICA

### (a) Conclusion and Implications for Manpower Planning in Africa

A major conclusion to be drawn from the above analysis is that the process of manpower planning relies substantially on the availability of vital population data. As stated, a series of relevant population data would be required for designing manpower sample surveys, for guiding manpower policy formulation and for estimating the levels and trend of present and future manpower supply and demand. Consequently, the need was stressed for demographers and manpower planners to work hand-in hand so as to ensure the availability and utilization of demographic data to facilitate the manpower planning process. Undoubtedly, the process of manpower planning could be seriously constrained by the lack of demographic data and/or the lack of institutional and staffing capabilities to utilize any existing demographic information and which, needless to say, affects adversely national and regional development efforts.

This realization together with pressing population problems impose new commitments on African governments and calls for new strategies in the areas of population data collection and manpower development and utilization planning particularly if the endorsed Lagos Plan of Action is to be implemented. Despite the 1969 recommendations made at the Seminar on Application of Demographic Data and Analysis to Development Planning, activities in these two areas have yet to be synchronized in nearly all African countries.1/ There are some hard facts which suggest that the elimination of this defficiency needs urgent attention in Africa. These facts include the following:2/

(i) The distribution of the age group within the African population, which is growing at an average annual rate of 3 per cent, reveals that Africa has a very young population with 55 per cent comprising persons 0 - 19 years and about 82 per cent below age 35 for whom jobs and schools must be found and provided.

(ii) African population is characterized by a very low educational profile. The inadequate structure, infrastructure and output of the African education and training systems resulting from the lack of appropriate planning, has proportionally given rise to illiteracy and the phenomenon of educated unemployed in the region despite the continued rise in annual expenditure on education per capita in most African countries.

(iii) Compounded with present high unemployment and underemployment rates is the persistant low GDP growth rate since 1960 averaging not more than 5 percent. More so a low probability that productivity would improve to sustain a population which is expected to double by the year 2000 exist; with those economically active reaching 225 million to fight for a little more than 100 million jobs.

These are certainly symptoms of population pressure and underdevelopment. Consequently, to foster development and thereby reverse this awkward situation, African planning capabilities will have to be developed to (i) reorient education and training programmes and facilities; (ii) provide adequate and productive urban and rural jobs; and (iii) increase the quantity and quality of output for the rapidly growing African population. This cannot be done in a vacum. Fundamentally the characteristics of the population for whom the planning is to be directed should be clearly understood and accounted for in the planning process.

(b) Major constraints and required action

While stressing the need for a better application of population data in manpower planning in Africa, one should not forget to dignose and minimize those existing constraints that could paralize the entire process.

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1/ See Economic Commission for Africa Report of the Seminar on Application of Demographic Data and Analysis to Development Planning, 2 - 9 June 1969, E/CN. 14/457-E/CN.14/POP/10-E/CN.4 CAS. 6/9.

2/ A detailed account of these facts are found in ECA Monograph No. 11 on Human Resources in Africa, November 1982, Addis Ababa.

Notably among these are[1/] (i) the lack of professional and skilled manpower planners, demographers and statisticians; (ii) the poor status of crude and processed population data; and (iii) the low recognition given to population dynamics as an important development variable. Some practical actions would therefore be required to bring about the necessary generation and utilization of demographic data into the process of manpower planning in Africa. Such actions should include:

(i) The organization and conduct of national workshops and/or seminars involving demographers, manpower planners and policy makers to consider issues relating to (a) the identification of requisite demographic variables for manpower planning and the review of methodology and feasibility of deriving such variables; and (b) the specific role to be played by population structure, composition and changes in the development process.

(ii) The institution of a staff development programme either at national or regional levels to embrace training of trainers, manpower statisticians and planners, demographers and development economists and administrators and other relevant professionals. and

(iii) A systematic exchange of country experiences on population data collection and tabulation together with manpower planning techniques as related to overall national development planning.

(c) Required Action

In light of the above discussion, we would like to conclude by making two important observations for your consideration and action. First, this workshop needs to formulate appropriate recommendations incorporating the above listed suggested actions along with necessary follow-up actions at national and regional levels for their implementation. Secondly, given the importance of this workshop to development planning, our findings and report should be shared with all the member States within the African region for their study and adoptation as each proceed with development planning and plan execution for the upliftment of its entire population.

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1/ These constraints were equally identified at the ECA Joint Conference of African Planners, Statisticians and Demographers in 1982 in ECA Doc. ST/ECA/PSD.2/3 relating to the Use of Population Data in Development Planning in Africa P.12

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